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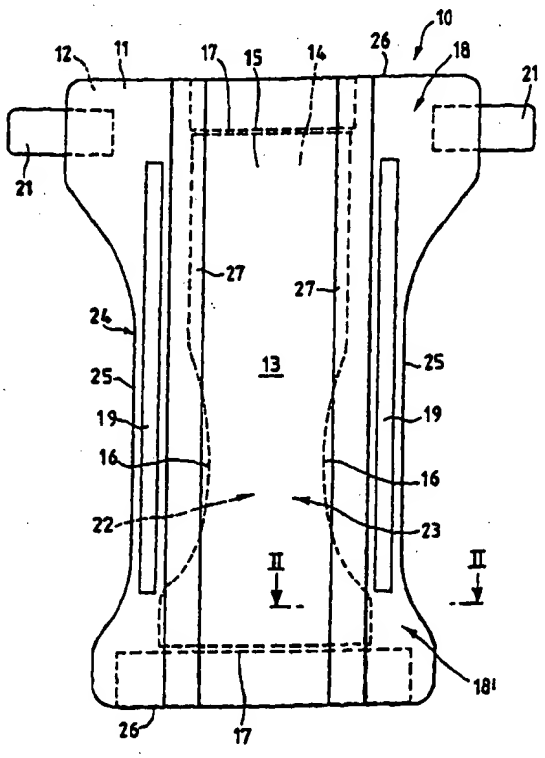
(54) Title: DISPOSABLE ABSORBENT PRODUCT

(57) Abstract

A disposable absorbent product which comprises a body which has an inner surface, an outer surface arranged opposite the inner surface, longitudinal edges, a first end region and a second end region opposite the first one, and comprises a liquid–impermeable lower layer (known as backsheet), an upper permeable or filtering layer (known as topsheet), and an absorbent inner region arranged between the topsheet and the backsheet, the liquid–permeable filtering topsheet being constituted by at least one layer of a material which comprises cotton fibers, the material having a wet–back value of 0.9 g or less and a liquid strike–through time of 5 seconds or less. The disposable absorbent product can have, on the surface facing the user's skin, containment barriers constituted by at least one layer of a material which comprises cotton fibers and has a wet barrier hydrostatic head value of 5 cm or more.



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DISPOSABLE ABSORBENT PRODUCT

TECHNICAL FIELD

The present invention relates to a disposable absorbent product.

BACKGROUND ART

In the production of disposable absorbent products, be they baby diapers, sanitary towels, panty shields, training pants, pull-on diapers, adult incontinence products, or absorbent products for milk leakage during breast-feeding (breast pads), products in which the upper layer in contact with the user's skin, known as topsheet, has specific characteristics have long become established.

Containment barriers, known as barrier leg cuffs when they are adjacent to each longitudinal edge and as waist cuffs when they are located at the end regions and optionally provided on the topsheet of the product that faces the user's skin, also have very specific characteristics. In the present description, except otherwise specified, the expression "containment barriers" designates both barrier leg cuffs and waist cuffs.

The characteristics of the topsheet are such as to facilitate rapid transfer of the liquid (for example urine) through the thickness of the topsheet toward the absorbent region.

Said topsheet also acts as a barrier against the return of the liquid from the inner absorbent region to the surface, i.e., toward the skin of the user.

This type of topsheet therefore allows to obtain a final product which rapidly filters the exuded liquids toward the inner region, where they are absorbed, and hinders their return to the surface.

Direct contact between the skin and the exuded liquid accordingly occurs for a very short time and the layer in contact with the skin remains substantially dry. Furthermore, the topsheet is soft and does not irritate the user's skin.

The described characteristics allow the topsheet of a disposable absorbent product to minimize the possibility of irritation, abrasion or

maceration of the user's skin.

Viscose topsheets have been produced, for example, but owing to the limited suitability of viscose to act as a barrier against the return of the liquid to the surface, the use of viscose has been found to be less than ideal in absorbent products meant to collect urine.

Likewise, after a few attempts, natural fibers such as for example cotton have not been used, since owing to their highly hydrophilic nature they produce topsheets which do not have a sufficient barrier effect against the return of the liquid from the absorbent inner region toward the surface and are therefore not sufficient dry when in contact with the user's skin.

In the present application, the term "hydrophilic" is used to describe fibers or fiber surfaces which are imbibed by aqueous liquids in contact with said fibers.

The degree of hydrophilicity of a material can be measured in each case by determining the angle of contact, i.e., the surface tension of the involved liquids and materials.

This measurement can be performed for example by means of a Cahn SFA-222 Surface Force Analyzer System instrument. When the measurements are performed with this instrument, according to the method described in US patent 5,364,382 (column 21, lines 1-20), the fibers that exhibit an angle of contact of less than 90° are termed hydrophilic and those with an angle of contact of more than 90° are termed hydrophobic.

The prior art has dealt in various ways with the problem of providing topsheets of disposable absorbent products with such characteristics and has solved this problem by using topsheets made of hydrophobic fibers, i.e., fibers which are impermeable to water and aqueous liquids, which are rendered hydrophilic, at least on the surface directed toward the user's skin, by treatment with surfactants, for example silicone polymers or polyethers.

In this manner, by limiting the hydrophobicity of the material, it is less likely that the exuded body liquids flow on the topsheet instead of being

absorbed by the absorbent inner region. The materials used are generally nonwovens constituted by synthetic fibers such as polypropylene, polyester, polyethylene, so called bi-components fibers or others or artifical fibers such as viscose.

Containment barriers, known as barrier leg cuffs when located adjacent to each longitudinal edge and as waist cuffs when located at the end regions, were originally devised to mechanically contain excrement.

The function of these barriers subsequently evolved and in the current art they are commonly characterized by a certain degree of hydrophobicity, thus allowing a certain containment of exuded liquids and at the same time allowing air flow and transpiration.

As noted for the topsheet, highly hydrophilic fibers and particularly natural fibers, such as for example cotton, have not been used in the provision of barrier leg cuffs or waist cuff barriers because barriers produced with said fibers would not hinder the passage of exuded liquids, which may leak out of the absorbent product.

Accordingly, these barriers are generally provided, as already described for the topsheet, by using nonwovens made of hydrophobic synthetic fibers, generally polypropylene, sometimes treated with hydrophobic additives in order to enhance its hydrophobicity.

These nonwovens can be prepared by means of a thermobonding or spunbonding process, according to the prior art, and optionally treated with hydrophobic additives. In the case of the spunbonding process, said nonwovens are often produced by combining hydrophobic fibers of different sizes, i.e., characterized by different dtex values, so as to obtain the chosen degree of hydrophobicity. These nonwovens are generally known as SM, SMS or SMMS because they are obtained by means of a spinning process which combines two well-known technologies: spunbonding and meltblown. In particular, the spunbonding process is performed with larger fibers (1 to 3 dtex), while the meltblown process is performed with

extremely thin fibers (0.01 to 0.1 dtex). Spunbonded filaments give the nonwoven softness and strength properties, while meltblown ones give the nonwoven uniformity, covering and hydrophobicity properties.

In this manner it is possible to obtain containment barriers which are soft in contact with the user's skin, do not irritate and have a specific degree of hydrophobicity.

DISCLOSURE OF THE INVENTION

The aim of the present invention, taking into account the increasingly widespread need to use natural fibers in any type of fabric in contact with the skin, is therefore to find an alternative solution for providing a disposable absorbent product which has the above described fundamental characteristics and combines them with the use of a natural fiber, such as for example cotton, which is better appreciated by the user owing to its particular characteristics of being natural, soft, biodegradable and less likely to cause allergies, irritations or rashes.

Accordingly, the present invention relates to a disposable absorbent product which comprises a body which has an inner surface, an outer surface arranged opposite the inner surface, longitudinal edges, a first end region and a second end region opposite the first one, and comprises a liquid-impermeable lower layer (known as backsheet), an upper permeable or filtering layer (known as topsheet), and an absorbent inner layer arranged between the topsheet and the backsheet, said product being optionally provided, on the surface directed toward the user's skin, with containment barriers located adjacent to each longitudinal edge and/or located at the end regions, characterized in that said liquid-permeable filtering topsheet is constituted by at least one layer of a material which comprises cotton fibers, said material having a wet-back value of 0.9 g or less, preferably 0.3 or less, and a liquid strike-through time of 5 seconds or less, preferably 3.5 seconds or less, and characterized in that said optional containment barriers are constituted by at least one layer of a material which comprises cotton fibers,

said material having a wet barrier-hydrostatic head value of 5 cm or more.

The present invention also relates to the use of said disposable absorbent product as a baby diaper, sanitary towel, panty shield, as training pants, as a pull-on diaper, adult incontinence product, and as an absorbent product for milk leakage during breast-feeding (breast pads).

Preferably, said material comprising cotton fibers has a wet-back value of 0.2 g or less and a liquid strike-through time of 3 seconds or less.

In particular, the disposable absorbent product according to the present invention has a filtering topsheet which comprises cotton fibers which have an average dtex value which can vary between 1 and 5 and are preferably subjected to a preliminary hydrophobic treatment.

Said hydrophobic treatment is performed by using additives in an amount which increases as the percentage of cotton fiber that is present in the material increases and decreases as the average dtex value of the cotton fiber increases.

In the disposable absorbent product according to the present invention, for filtering topsheets containing less than 95% cotton fibers the same result is also achieved by selecting cotton fibers which have a sufficiently high average dtex value in relation to the percentage of cotton fibers used.

If the disposable absorbent product according to the present invention has a filtering topsheet which comprises cotton fibers which have not been subjected to a hydrophobic treatment, it is provided by preferably selecting cotton fibers which have an average dtex value which can vary between 2.5 and 5.

The disposable absorbent product according to the present invention can have containment barriers which comprise cotton fibers having an average dtex value which can vary between 1 and 5 and subjected beforehand to a hydrophobic treatment, wherein the cotton fiber percentage is between 5 and 100.

WAYS OF CARRYING OUT THE INVENTION

The characteristics and advantages of the disposable absorbent product according to the present invention will become apparent from the following detailed exemplifying description, which also relates to the accompanying figures 1 to 3.

The hydrophobic treatment applied to the cotton fibers in both applications, i.e., to provide the topsheet or the containment barriers of the disposable absorbent product according to the present invention, varies according to the geometric characteristics of the cotton fibers, causes no damage to the fiber and does not irritate the user's skin.

As mentioned, the use of cotton fiber in providing the topsheet or containment barriers of a disposable absorbent product is absolutely not straightforward and has entailed solving several problems, since an ordinary cotton fiber, if not treated or selected on the basis of specific average size characteristics, does not meet the above requirements.

Cotton is in fact a hydrophilic fiber, and accordingly it cannot be used as it is as a filtering topsheet in the production of absorbent products, since the fundamental characteristic of the topsheet is indeed to facilitate rapid transfer of the liquid (for example urine) through its thickness, toward the absorbent region, and to have a barrier effect against the return of the liquid from the absorbent inner region toward the user's skin. Direct contact between the skin and the exuded liquid therefore occurs for a very short time and the layer in contact with the skin remains substantially dry.

Even more so, an ordinary cotton fiber cannot be used to produce containment barriers, which are characterized by a certain degree of hydrophobicity, due to its hydrophilic characteristics, which make it a material which is highly permeable to said liquids.

A) The topsheet

Indeed in order to obtain a filtering or dry topsheet, as mentioned, the topsheets that are currently used commercially are preferably based on polypropylene, i.e., on inherently hydrophobic polymeric fibers, which are

subjected to a hydrophilic treatment in order to allow the exuded liquid to flow over the surface of fibers and therefore to move away from the skin, penetrating toward the absorbent inner region, and to act at the same time as a barrier against the return of the liquid to the surface thanks to the hydrophobic characteristics that it has maintained.

A topsheet containing ordinary cotton fibers, owing to their high hydrophilicity, instead has the following characteristics:

1. it filters adequately. It allows, in fact, the rapid passage of the liquid through its thickness toward the absorbent inner region;

2. it is not adequately dry in contact with the user's skin. Liquid is held in the topsheet by the cotton fibers, leaving it damp; it does not provide an adapted barrier effect against the return of the liquid from the inner part of the product to the surface.

As shown hereinafter, the two factors that are measured and allow to evaluate the validity of a material as a topsheet are wet-back and liquid strike-through time.

The wet-back value, as defined by the ERT 151.1-96 method recommended by EDANA (European Disposables And Nonwovens Association), quantifies the capacity of the topsheet to act as a barrier against the return toward the skin of the liquid that has already been filtered by said topsheet.

In practice, the amount of liquid filtered by the topsheet and absorbed by a standard pad is measured, said liquid crossing the topsheet again due to an applied standard pressure. The smaller the amount of liquid which, released by the standard pad, crosses the topsheet again and returns to the surface of the absorbent product, where it is measured, i.e., the lower the wet-back value, the higher the effectiveness of the barrier effect provided and therefore the more the material is adapted for producing a topsheet.

In summary, therefore, a low wet-back value demonstrates that the topsheet has no tendency to carry the already-filtered liquid back toward the

skin.

The Liquid Strike-Through Time test, as defined in the ERT 150.3-96 method recommended by EDANA, measures the time taken by a known volume of liquid, applied to the surface of a topsheet specimen arranged on top of a standard absorbent pad, to cross said topsheet.

A low liquid strike-through time value demonstrates that the topsheet has a high tendency to rapidly filter the liquid toward the absorbent inner region.

A consequence of the above is that since a topsheet must have a high barrier effect against the return of liquid to the surface and also an excellent filtering capacity so as to rapidly convey the liquid toward the absorbent inner region, in theory the performance of the material improves as the values of wet-back and liquid strike-through time decrease.

In practice, since the wet-back value is linked to the hydrophobic characteristics of the topsheet and the liquid strike-through time value is linked to its hydrophilic characteristics, it is necessary to balance the two characteristics, obtaining the optimum balance value for providing a topsheet which is adequately dry and filtering.

An ordinary cotton fiber, owing to its highly hydrophilic nature, produces a fabric with an absolutely inadequate wet-back value and therefore cannot be used to produce a topsheet which acts as a barrier to the return of the absorbed liquid to the surface, although it is characterized by a good liquid strike-through time value.

Accordingly, it is not possible to use an ordinary cotton fiber to produce the topsheet for the disposable absorbent product according to the present invention, since one would obtain an excessively moist layer in contact with the user's skin.

The cotton fiber used to produce the disposable absorbent product according to the present invention is a cotton fiber which is selected according to precise dimensional characteristics or average dtex values

and/or conveniently treated so as to give it specific hydrophobic characteristics, thus achieving the chosen balance between filtering capacity (low liquid strike-through time value) and effective barrier effect (low wet-back value).

Examples of suitable fibers can be selected from the Luxicot range of cotton comber noil from Edward Hall Ltd. (United Kingdom).

Said cotton fibers are subjected to a treatment which limits their hydrophilic properties by using appropriate additives for example as used in the textile industries. The additives for example can be waxes, in an emulsion or disperse system in hot water, in a percentage between 0.01 and 40% by weight with respect to the amount of cotton. A specific example of the treatment is available from Catomance Plc. (United Kingdom). In particular, said additives can be used in an amount between 0.5 and 20% by weight.

The hydrophobic treatment on the cotton fibers varies according to the geometric characteristics of said fibers. In particular, the amount of hydrophobic additive that is to be added decreases as the average dtex value of the fibers used increases.

In the present description, the term "dtex" is used to designate the weight in grams of a fiber 10,000 meters long.

In particular, as noted above, in the disposable absorbent product according to the present invention the filtering, liquid-permeable topsheet is constituted by at least one layer made of a material which comprises cotton fibers, having an average dtex value which can vary between 1 and 5, said cotton fibers being preferably subjected beforehand to a hydrophobic treatment.

The topsheet produced with the above described cotton fibers has the following characteristics:

- it acts as a barrier to the return of the liquid toward the surface and the skin of the user

- it allows the exuded liquid to cross it rapidly.

These characteristics have been measured, by way of example, for different types of material usable as a topsheet or as a topsheet layer containing cotton fibers for the disposable absorbent product according to the present invention; the results are given in the table that follows.

In particular, the methods used for wet-back and liquid strike-through time measurement are the standard methods suggested and recommended by EDANA.

Parameter, method	Material				
	A1	A2	A3	B1	C
Wet-back EDANA ERT 150.3-96	3.0 g	0.2 g	0.2 g	13.5 g	0.2 g
Liquid strike-through time EDANA ERT 151.1-96	2.7 s	2.5 s	2.5 s	2.2 s	2.5 s

Example A1

In the above table, A1 designates a material constituted by 30% cotton fibers not subjected to hydrophobic treatment and 70% polypropylene fibers, said material being prepared by means of a carding and thermal calendering process (known as thermobonding) and having a grammage of 22 g/m^2 and an average dtex value of the cotton fibers equal to 1.2.

The topsheet produced with material A1 does not provide a barrier effect against the return of wetness toward the surface, as shown by the high wet-back value, but it has good filtering properties, as shown by the low liquid strike-through time value.

This shows that a topsheet containing ordinary cotton fibers, i.e., untreated fibers having inappropriate size characteristics, is not adequately dry.

Example A2

In the above table, A2 designates a material constituted by 30% cotton fibers subjected to hydrophobic treatment, particularly treated with 3 g of additive per 100 g of cotton fibers and 70% polypropylene fibers, said material being prepared by means of a carding and thermal calendering process (known as thermobonding) and having a grammage of 22 g/m^2 and an average dtex value of the cotton fibers equal to 1.2.

The topsheet produced with material A2 provides a good barrier effect against the return of wetness to the surface, as shown by the low wet-back value, and maintains good filtering properties, as shown by the low liquid strike-through time value.

This shows that according to the present invention it is possible to provide a topsheet for a disposable absorbent product containing cotton fibers treated with an adequate amount of hydrophobic additive so as to achieve the intended balance between the barrier effect and the filtering characteristics.

Example A3

In the above table, A3 designates a material constituted by 30% cotton fibers not subjected to a hydrophobic treatment, and 70% polypropylene fibers; the material is prepared by means of a carding and thermal calendering process (known as thermobonding) and has a grammage of 22 g/m^2 and an average dtex value of the cotton fibers equal to 3.

The topsheet produced with material A3 provides a good barrier effect against the return of wetness to the surface, as shown by the low wet-back value, and also has good filtering properties, as shown by the low liquid strike-through time value.

This shows that according to the present invention it is possible to provide a topsheet for a disposable absorbent product containing cotton fibers selected with specific and clearly defined dimensional characteristics, i.e., with specific and definite average dtex values, so as to achieve the

intended balance between the barrier effect and the filtering characteristics.

Example B1

In the above table, B1 designates a material constituted by 100% untreated cotton, prepared by means of a hydroentanglement process and having a grammage of 40 g/m^2 and an average dtex value of the cotton fibers equal to 1.2.

The topsheet produced with material B1 does not provide a barrier effect against the return of wetness to the surface, as shown by the high wet-back value, but it has good filtering properties, as shown by the low liquid strike-through time value.

This shows once again that a topsheet containing untreated cotton fibers is not adequately dry.

Example C

In the above table, C designates a conventional-type topsheet, as commonly used by the current art, constituted by 100% polypropylene fibers (standard hydrophilic treatment) prepared according a thermobonding process and with a grammage of 22 g/m^2.

The topsheet produced with material C provides a good barrier effect against the return of wetness to the surface, as shown by the low wet-back value, and has acquired, thanks to the hydrophilic treatment, good filtering properties, as shown by the low liquid strike-through time value.

The values obtained with material C are fully comparable with those obtained with materials A2 and A3, showing that the topsheet with cotton fibers according to the present invention has the same performance as a conventional topsheet.

As noted, the disposable absorbent product according to the present invention has a filtering topsheet which comprises cotton fibers having an average dtex value which can vary between 1 and 5, said cotton fibers being preferably subjected to a prior hydrophobic treatment, and in which the cotton percentage is between 5 and 100%.

In particular, the topsheet filtering layer of the disposable absorbent product according to the present invention has a grammage between 10 and 300 g/m^2. Preferably, the grammage of the filtering layer is between 14 and 40 g/m^2 when the cotton percentage by weight in the topsheet is between 5 and 60% and is between 25 and 60 g/m^2 when the treated cotton percentage by weight in the topsheet is 100%.

The cotton fiber used in producing the topsheet of the disposable absorbent product according to the present invention preferably has average dtex values between 1.2 and 3.5.

These dimensional characteristics allow to optimize both the calendering process and the performance of the topsheet.

The calendering process is optimized because if the cotton fibers are bigger for an equal percentage by weight, one has a smaller number of fibers for the cotton with respect to the synthetic and therefore there is less interference by the cotton in the thermal bonds between synthetic.

As regards performance particularly to achieve low wet back, it is very important that the cotton fiber have appropriate dimensions and particularly a high dtex value in order to reduce the wettable surface and the surface to volume (S/V) ratio.

As noted earlier, the disposable absorbent product according to the present invention is preferably produced with cotton fibers which are not subjected to any hydrophobic treatment when the cotton fibers are characterized by specific and well-defined dimensional parameters, i.e., when their average dtex value is between 2.5 and 5, preferably 3. The hydrophobic treatment can in any case also be performed on fibers having these dimensions.

Various characteristics of the topsheet are thus optimized: said topsheet allows the exuded liquid to flow toward the absorbent pad at a sufficiently rapid rate and at the same time constitutes a barrier against the return of the liquid to the surface, remaining dry in contact with the skin.

The present invention also relates to a disposable absorbent product which comprises a body which has an inner surface, an outer surface arranged opposite the inner surface, longitudinal edges, a first end region and a second end region located opposite the first end region, and comprising a liquid-impermeable lower layer (known as backsheet) and a filtering or permeable upper layer (known as topsheet), an inner absorbent region arranged between the topsheet and the backsheet, said liquid-permeable filtering topsheet being constituted by at least one layer of a material which comprises cotton fibers, said material having a wet-back value of 0.9 g or less, preferably 0.3 g or less and a liquid strike-through time value of 5 seconds or less, preferably 3.5 seconds or less, and wherein said topsheet is prepared by means of a thermobonding, airthrough bonding, resin-bonding or hydroentanglement process.

Different methods can in fact be used to produce the topsheet.

A first method for preparing the topsheet is thermobonding: in this method, the cotton fibers are mixed with for example polypropylene fibers, carded on one or more layers and then passed under a calender which, by virtue of the combined action of pressure and heat, traps them inside the welded matrix of for example polypropylene fibers.

In particular, if the cotton fiber-containing topsheet of the disposable absorbent product according to the present invention is produced by thermobonding, it has a cotton percentage by weight between 5 and 60%, a grammage between 10 and 50 g/m^2, preferably between 10 and 50 g/m^2, more preferably between 14 and 26 g/m^2, and average dtex values of the cotton fibers between 1.2 and 3.5.

Preferably, the treated cotton percentage by weight is 30%.

A second method for producing a topsheet is airthrough bonding.

In this method, the cotton fibers are mixed with for example polypropylene fibers, carded in one or more layers and then bonded by means of a stream of hot air.

In particular, if the cotton fiber-containing topsheet of the disposable absorbent product according to the present invention is produced by airthrough bonding, it has a cotton percentage by weight between 5 and 50%, a grammage between 10 and 300 g/m^2, preferably between 14 and 40 g/m^2, and average dtex values of the cotton fibers between 1.2 and 3.5.

Said thermobonding and airthrough bonding processes obviously cannot be used if the topsheet is constituted exclusively by cotton fibers.

In this case, the cotton fiber-containing topsheet of the disposable absorbent product according to the present invention is in fact produced by means of the so-called hydroentanglement method, in which the percentage of cotton in the topsheet can reach 100% and the grammage can reach 100 g/m^2.

When the topsheet is produced by means of a hydroentanglement process, i.e., by using high-pressure water jets, the topsheet has a cotton percentage by weight between 5 and 100%, preferably 100%, a grammage between 10 and 100 g/m^2, preferably between 25 and 60 g/m^2, and average dtex values of the cotton fibers between 1.2 and 3.5.

An advantage of hydroentanglement process is that the topsheet can be perforated during its formation to allow better balance between strike through and wet back

Other methods that can be used are, for example, resin-bonding, which consists of a carding process followed by the bonding of the fibers by means of resins.

This method allows to work with higher cotton percentages than allowed by thermobonding and airthrough bonding.

When the topsheet according to the present invention is produced by resin bonding, it in fact has a cotton percentage by weight between 5 and 90%, a grammage between 10 and 60 g/m^2, preferably between 14 and 30 g/m^2, and average dtex values of the cotton fibers between 1.2 and 3.5.

As an alternative, it is possible to laminate a material which comprises

cotton fibers, produced by means of one of the above methods and bonded by means of adhesives or ultrasound bonding to a nonwoven topsheet made of synthetic fibers.

The disposable absorbent product according to the invention can in fact also have a topsheet constituted by at least two bonded layers, in which one layer placed in contact with the user's skin is constituted by material which comprises cotton fibers and is then coupled to one or more layers directed toward the absorbent inner region which are constituted by a conventional topsheet based on artificial fibers, such as for example polypropylene, said bonded composite material having a wet-back value of 0.9 g or less, preferably 0.3 g or less, and a liquid strike-through time value of 5 seconds or less, preferably 3.5 seconds or less.

In this application, the cotton percentage by weight in the layer in contact with the skin can be between 5 and 100%, preferably between 70 and 100%, with a grammage between 5 and 100 g/m^2, preferably between 5 and 60 g/m^2, and average dtex values of the cotton fibers between 1.2 and 3.5.

B) Containment barriers

As noted earlier, in the course of the evolution of the role of containment barriers it has become very important for said barriers to have a specific degree of hydrophobicity, thus allowing a certain containment of the exuded liquids and at the same time allowing air passage and transpiration.

This containment of exuded liquids can be measured by means of the test known as Wet Barrier-Hydrostatic Head.

The Wet barrier-Hydrostatic Head measurement, as defined in the ERT 160.0-89 method recommended by EDANA, defines the resistance of a nonwoven to the penetration of aqueous liquids.

This property is measured indirectly by determining the minimum height of the water head that must be applied to the material being tested in order to cause the first drop of water to pass through the thickness of the material.

By performing measurements according to this method, the height of the

water head sustained by containment barriers providing a certain containment of exuded liquids of commercially available absorbent products is found to be generally 5 cm or higher.

Containment barriers made of a nonwoven which contains cotton fibers, which as known are highly hydrophilic, would show a low wet barrier-hydrostatic head value. The hydrophilic nature of cotton fibers in fact gives hydrophilic properties to the entire nonwoven, which accordingly exhibits practically no capacity to contain exuded liquids.

The cotton fiber used to produce the containment barriers of the disposable absorbent product according to the present invention is a cotton fiber which has an average dtex value which can vary between 1 and 5 and is subjected beforehand to a hydrophobic treatment and is accordingly capable of reaching the chosen level of hydrophobicity and therefore of achieving a certain containment of exuded liquids (high wet barrier-hydrostatic head value).

Examples of suitable fibers can be selected from the Luxicot range of cotton comber noil from Edward Hall Ltd. (United Kingdom).

Said fibers are subjected to a treatment which limits their hydrophilic properties by using adapted additives, such as waxes in an emulsion or in a disperse system in hot water, in a percentage between 0.01 and 40% by weight with respect to the amount of cotton. In particular, said additives can be used in an amount between 5 and 25% by weight.

The containment barriers according to the present invention are constituted by at least one layer of material which comprises cotton fibers having an average dtex value which can vary between 1 and 5, said cotton fibers being subjected beforehand to a hydrophobic treatment, wherein said material is prepared by means of a thermobonding or hydroentanglement process.

As described earlier, the disposable absorbent product according to the present invention can have, on the surface directed toward the user's skin,

containment barriers which are constituted by at least one layer of material comprising cotton fibers having an average dtex value which can vary between 1 and 5 and subjected beforehand to a hydrophobic treatment, where the cotton percentage is between 5 and 100%.

The material used to produce the containment barriers of the disposable absorbent product according to the present invention has a grammage between 5 and 100 g/m^2.

Preferably, the grammage of the containment barriers is between 10 and 50 g/m^2 when the treated cotton percentage by weight in the barriers is between 5 and 60% and is between 25 and 60 g/m^2 when the treated cotton percentage by weight is 100%.

The cotton fiber used in producing the containment barriers of the disposable absorbent product according to the present invention has average dimensional characteristics comprised between 1 and 5 dtex. In particular, according to the present invention, cotton fibers having average dimensions between 1.2 and 3.5 dtex are preferably used.

The hydrophobicity characteristics considered above were measured, by way of example, for different types of material containing cotton fibers which can be used as a containment barrier for the disposable absorbent product according to the present invention; the results are given in the table that follows.

In particular, the method used to measure the wet barrier-hydrostatic head is one of the two standard methods suggested and recommended by EDANA for measuring the resistance of a nonwoven to liquid penetration.

Parameter	Method	Material				
		D1	D2	E1	E2	F
Wet barrier-hydrostatic head	EDANA 160.0-89	not measurable	6 cm	not measurable	15 cm	15 cm

Example D1

In the above table, D1 designates a material constituted by 30% cotton fibers not subjected to hydrophobic treatment and 70% polypropylene fibers, said material being prepared by means of a carding and thermal calendering process (known as thermobonding) and having a grammage of 20 g/m^2.

The containment barriers produced with material D1 are not sufficiently hydrophobic, as shown by the impossibility to measure a wet barrier-hydrostatic head value, since the water head does not form because the liquid passes immediately through the thickness of the material.

Example D2

In the above table, D2 designates a material constituted by 30% cotton fibers subjected to a hydrophobic treatment, particularly with 10 g of hydrophobic additive per 100 g of cotton fibers, and 70% polypropylene fibers, said material being prepared by means of a carding and thermal calendering process (known as thermobonding) and having a grammage of 20 g/m^2.

The containment barriers produced with material D2 acquired a certain degree of hydrophobicity and therefore of liquid containment properties, as shown by the wet barrier-hydrostatic head value.

Example E1

In the above table, E1 designates a material constituted by 100% cotton fibers not subjected to a hydrophobic treatment and prepared by a hydroentanglement method with a grammage of 27 g/m^2.

The containment barriers produced using material E1 have no hydrophobicity characteristic, as shown by the impossibility to measure a wet barrier-hydrostatic head value, since the water head does not form because the liquid passes immediately through the thickness of the material.

Example E2

In the above table, E2 designates a material constituted by 100% cotton

fibers subjected to hydrophobic treatment, particularly treated with 20 g of hydrophobic additive per 100 g of cotton fibers, said material being prepared by means of a hydroentanglement process and having a grammage of 27 g/m^2.

The containment barriers produced using material E2 are highly hydrophobic and therefore have liquid containment properties, as shown by the wet barrier-hydrostatic head value, equal to 15 cm.

Example F

In the above table, F designates a material constituted by 100% polypropylene fibers, said material being prepared according to the method known as SMS by bonding two layers of spun-bonded material and a melt-blown one and having a total grammage of 20 g/m^2.

The values obtained with material F are fully comparable with those obtained with material E2; this shows that the containment barriers made of cotton fibers according to the present invention have a degree of hydrophobicity, and therefore an ability to provide a certain containment of exuded liquids, which are comparable with those of conventional containment barriers, as provided with the current art and with liquid containment properties.

The disposable absorbent product according to the present invention can also have containment barriers constituted by at least two bonded layers in which one layer placed in contact with the user's skin is constituted by material comprising cotton fibers, while the remaining one or more layers, arranged toward the inside and not in contact with the user's skin, are constituted by synthetic fibers, wherein said bonded composite material has an average wet barrier-hydrostatic head of 5 cm or more.

In particular, the layer placed in contact with the user's skin is constituted by a material which comprises cotton fibers having an average dtex value which can vary between 1 and 5, said cotton fibers being subjected beforehand to a hydrophobic treatment.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a plan view of a first simplified embodiment of an absorbent product according to the present invention.

Figure 2 is an enlarged-scale sectional view, taken along the plane II-II, of a detail of the simplified embodiment of the absorbent product according to the invention shown in figure 1.

Figure 3 is a plan view of another simplified embodiment of an absorbent product according to the present invention.

In particular, said first embodiment illustrates a baby diaper 10, showing in the foreground the internal surface 11, known as topsheet, which is liquid-permeable. Said diaper 10 has a topsheet 11, an impermeable backsheet 12 and an absorbent inner region 13 which can be constituted by various layers, for example layers of cotton wool, fluff and superabsorbent polymer, an acquisition layer, according to the prior art, arranged between the topsheet 11 and the backsheet 12, said absorbent inner region having a surface 14 which faces away from the body, i.e., toward the clothing, a surface 15 which is directed toward the skin, lateral edges 16, a waist edge 17, a first end region 18 and a second end region 18' arranged opposite the first one. The diaper 10 also has elasticated regions 19 which close around the legs and a closure system 21. The diaper 10, shown in simplified form in figures 1 and 2, is also provided with containment barriers (barrier leg cuffs) 27 and 27' at each longitudinal edge 25.

The particular embodiment of the disposable absorbent product according to the present invention, i.e., of the diaper 10, shown in figure 1, also has an outer surface 22 and an inner surface 23 which lies opposite the surface 22, a peripheral region 24 formed by the outer edges of the diaper 10, in which the longitudinal edges are designated by the reference numeral 25 and the upper and lower edges are designated by the reference numeral 26.

The outer surface 22 of the diaper 10 constitutes the portion of the diaper

10 that is in contact not with the skin but with the user's clothing and is generally constituted by the backsheet 12 and by optional other components which can be coupled to the backsheet 12.

The inner surface 23 of the diaper 10 constitutes the portion of the diaper 10 that is in contact with the user's skin and is generally constituted by the topsheet 11 and by optional other components which can be coupled to the topsheet, such as for example the lateral containment barriers (barrier leg cuffs) 27 and 27'.

The further embodiment shown in figure 3 illustrates a sanitary towel 28, showing in the foreground the liquid-permeable inner surface 29, known as topsheet. Said sanitary towel 28 has a topsheet 29, an impermeable backsheet 30 and an absorbent inner region 31 which, as known in the current art, can be constituted by various layers, for example layers of cotton wool, fluff and superabsorbent polymer, and by an optional acquisition layer, said absorbent inner region 31 being arranged between the topsheet 29 and the backsheet 30. In the particular embodiment shown in figure 3, the topsheet 29 and the backsheet 30 have identical dimensions which are greater than those of the absorbent inner region 31. The topsheet 29 overlaps the backsheet 30 in the lateral region 32 and in a second lateral region 32' located opposite the absorbent inner region 31 of the sanitary towel 28.

The sanitary towel 28 also has a surface 33 directed away from the body, i.e., toward the clothing, a surface 34 directed toward the skin, and lateral edges 35. In the particular embodiment shown in figure 3, it also has two lateral regions 36, known as wings, outside the regions 32 and 32', said regions 36 being provided with adhesive means 37. Said lateral regions 36 may in any case not be present. The sanitary towel 28 is also provided with an adhesive system for fixing to underwear 38 and can also optionally have longitudinally arranged containment barriers 39.

The disposable absorbent product according to the present invention

therefore allows the skin of the child or user to be completely surrounded by the topsheet and by the barrier leg cuffs and waist cuffs, if provided, i.e., by the materials that comprise cotton fibers with an average dtex value which can vary between 1 and 5, preferably subjected to a prior hydrophobic treatment when said dtex value varies between 1 and 2.5 in the case of the topsheet and subjected to a prior hydrophobic treatment when said dtex value varies between 1 and 5 in the case of the barriers.

The main advantage of the disposable absorbent product according to the present invention is therefore that it uses a natural fiber, particularly cotton, which thanks to its particular characteristics of softness, biodegradability, naturalness, lower tendency to cause allergies, irritations or rashes is better appreciated by the user but at the same time provides a topsheet, i.e., a layer in contact with the user's skin, which is dry, provides effective filtration and highly hydrophobic barrier leg cuffs and waist cuffs, if present.

The disposable absorbent product according to the present invention furthermore has the additional advantage of greater, albeit minimal, biodegradability of the final product.

Having described the invention in great detail, it is immediately evident that various modifications can be made without thereby altering its content. These modifications are to be understood as being within the scope of the invention as defined by the appended claims.

CLAIMS

1. A disposable absorbent product comprising a body which has an inner surface, an outer surface arranged opposite the inner surface, longitudinal edges, a first end region and a second end region opposite the first one, and comprising a liquid-impermeable lower layer (known as backsheet), an upper permeable or filtering layer (known as topsheet), and an absorbent inner layer arranged between the topsheet and the backsheet, said product being optionally provided, on the surface directed toward the user's skin, with containment barriers located adjacent to each longitudinal edge and/or located at the end regions, characterized in that said liquid-permeable filtering topsheet is constituted by at least one layer of a material which comprises cotton fibers, said material having a wet-back value of 0.9 g or less and a liquid strike-through time of 5 seconds or less, and characterized in that said optional containment barriers are constituted by at least one layer of a material which comprises cotton fibers, said material having a wet barrier-hydrostatic head value of 5 cm or more.

2. The disposable absorbent product according to claim 1, characterized in that said topsheet material comprising cotton fibers has a wet-back value of 0.2 g or less and a liquid strike-through time value of 3 seconds or less.

3. The disposable absorbent product according to claim 1, characterized in that the upper filtering layer or topsheet comprises cotton fibers which have an average dtex value which can vary between 1 and 5 and said optional barriers are constituted by at least one layer of a material which comprises cotton fibers which have an average dtex value which can vary between 1 and 5, subjected beforehand to a hydrophobic treatment.

4. The disposable absorbent product according to claim 3, characterized in that the cotton fibers of the upper filtering layer or topsheet are subjected beforehand to a hydrophobic treatment.

5. The disposable absorbent product according to claim 3, characterized in that the cotton fibers of the upper filtering layer or topsheet have an

average dtex value which can vary between 2.5 and 5.

6. The disposable absorbent product according to claim 1, characterized in that the upper filtering layer or topsheet and the containment barriers have a cotton fiber percentage by weight between 5 and 100%.

7. The disposable absorbent product according to claim 1, characterized in that the cotton fiber percentage in the topsheet is approximately 30%.

8. The disposable absorbent product according to claim 3, characterized in that the cotton fiber used for the topsheet and for the containment barriers is subjected beforehand to a hydrophobic treatment by using additives in a percentage between 0.01 and 40% by weight with respect to the amount of cotton.

9. The disposable absorbent product according to claim 8, characterized in that said additives are used in an amount between 0.5 and 10% by weight with respect to the amount of cotton, in the case of the topsheet, and in an amount between 5 and 25% by weight with respect to the amount of cotton, in the case of the barriers.

10. The disposable absorbent product according to claim 4, characterized in that the cotton fiber of the topsheet and of the containment barriers has an average dtex value between 1.2 and 3.5.

11. The disposable absorbent product according to claim 1, characterized in that the topsheet filtering layer has a grammage between 5 and 300 g/m^2, preferably between 14 and 40 g/m^2 when the cotton percentage by weight is between 5 and 60%, and between 25 and 60 g/m^2 when the cotton percentage by weight is 100%.

12. The disposable absorbent product according to claim 1, characterized in that the containment barriers have a grammage between 10 and 100 g/m^2.

13. The disposable absorbent product according to claim 1, characterized in that the outer layer of the topsheet is constituted by at least two bonded layers, in which one layer, placed in contact with the user's skin, is constituted by a material which comprises cotton fibers, said layer being

then bonded to one or more layers which are directed toward the absorbent inner region and are constituted by a conventional topsheet based on synthetic fibers, said bonded composite material having a wet-back value of 0.9 g or less and a liquid strike-through time of 5 seconds or less.

14. The disposable absorbent product according to claim 1, characterized in that the containment barriers are constituted by at least two bonded layers, in which one layer, which is in contact with the user's skin, is constituted by material comprising cotton fibers, whereas the remaining one or more layers, which are internal and are not in contact with the user's skin, are constituted by synthetic fibers, said bonded composite material having a wet barrier-hydrostatic head value of 5 cm or more.

15. The disposable absorbent product according to one of claims 13 and 14, characterized in that the layer placed in contact with the user's skin is constituted by a material which comprises cotton fibers having an average dtex value which can vary between 1 and 5, said cotton fiber being subjected beforehand to a hydrophobic treatment.

16. The disposable absorbent product according to claim 13, characterized in that the cotton percentage by weight in the layer in contact with the skin is preferably between 70 and 100% and has a grammage between 5 and 60 g/m^2.

17. The disposable absorbent product according to claim 1, characterized in that said topsheet is prepared by means of a thermobonding or airthrough bonding process, and said optional barriers are prepared by means of a thermobonding or hydroentanglement process.

18. The disposable absorbent product according to claim 17, characterized in that the topsheet has a cotton percentage by weight between 5 and 60%, preferably 30%, a grammage between 10 and 50 g/m^2, preferably between 14 and 26 g/m^2, and an average cotton fiber dtex value between 1.2 and 3.5.

19. The disposable absorbent product according to claim 1,

characterized in that said topsheet is prepared by means of a resin-bonding process and said optional barriers are prepared by means of a thermobonding or hydroentanglement process.

20. The disposable absorbent product according to claim 19, characterized in that the topsheet has a cotton percentage by weight between 5 and 90%, a grammage between 10 and 60 g/m^2, preferably between 14 and 30 g/m^2, and an average cotton fiber dtex value between 1.2 and 3.5.

21. The disposable absorbent product according to claim 1, characterized in that said topsheet is prepared by means of a hydroentanglement process and said optional barriers are prepared by means of a thermobonding or hydroentanglement process.

22. The disposable absorbent product according to one of claims 17,19 and 21, characterized in that the topsheet is constituted by a material comprising cotton fibers with an average dtex value between 1 and 5, preferably subjected to a prior hydrophobic treatment, and said optional barriers are constituted by a material which comprises cotton fibers which have an average dtex value between 1 and 5, subjected beforehand to a hydrophobic treatment.

23. The disposable absorbent product according to claim 21, characterized in that said topsheet and/or said optional barriers have a cotton percentage by weight between 5 and 100%, preferably 100%, a grammage between 10 and 100 g/m^2, preferably between 25 and 60 g/m^2, and an average dtex value of the cotton fibers between 1.2 and 3.5.

24. The disposable absorbent product according to one of claims 10, 17, 19 and 21, characterized in that the cotton fiber has an average dtex value of 3.

25. The disposable absorbent product according to claim 1, characterized in that the topsheet is constituted by 30% cotton, treated with 3 g of hydrophobic additive per 100 g of cotton fibers, and 70% polypropylene, said material being prepared beforehand by means of a thermobonding

process and having a grammage which can vary between 14 and 26 g/m^2 and an average cotton fiber dtex value of 1.2.

26. The disposable absorbent product according to claim 1, characterized in that the topsheet is constituted by 100% treated cotton, obtained with 3 g of hydrophobic additive per 100 g of cotton fiber, said material being prepared beforehand by means of a hydroentanglement process and having a grammage which can vary between 25 and 60 g/m^2 and an average cotton fiber dtex value of 1.2.

27. The disposable absorbent product according to claim 1, characterized in that the containment barriers are constituted by 30% treated cotton, obtained with 15 g of hydrophobic additive per 100 g of cotton fibers, and 70% polypropylene fibers, prepared by means of a thermobonding process and having a grammage which can vary between 15 and 30 g/m^2.

28. The disposable absorbent product according to claim 1, characterized in that the containment barriers are constituted by 100% treated cotton, obtained with 20 g of hydrophobic additive per 100 g of cotton fibers, prepared by means of a hydroentanglement process and having a grammage which can vary between 25 and 35 g/m^2.

29. The disposable absorbent product according to claim 1, characterized in that the topsheet is constituted by 30% cotton fibers with an average dtex value of 3 and by 70% polypropylene, said material being prepared beforehand by means of a thermobonding process and having a grammage of 22 g/m^2.

30. The disposable absorbent product according to one of claims 1 to 29, for use as an article selected from the group consisting of a baby diaper, a sanitary towel or panty shield, an adult incontinence product, and as an absorbent product for milk leakage during breast-feeding (breast pads).

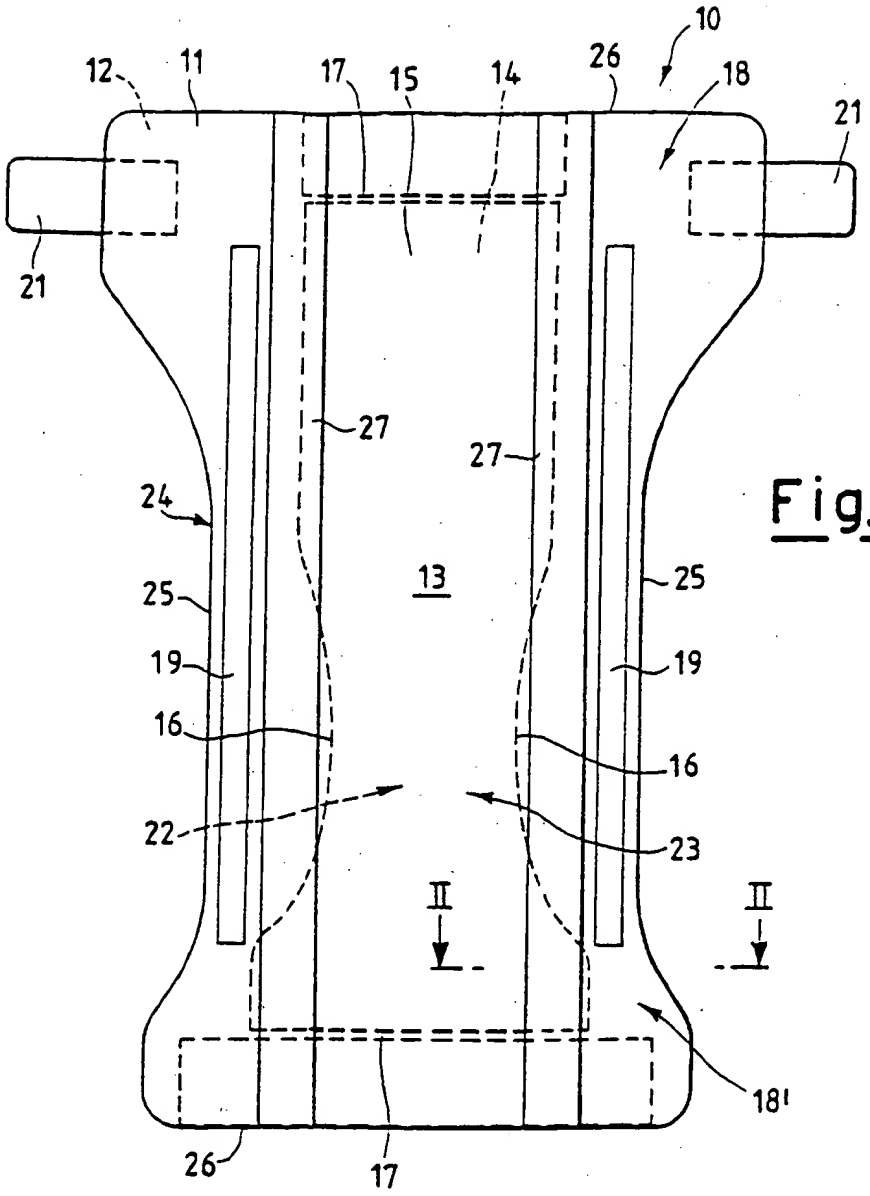
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Fig.1

Fig.2

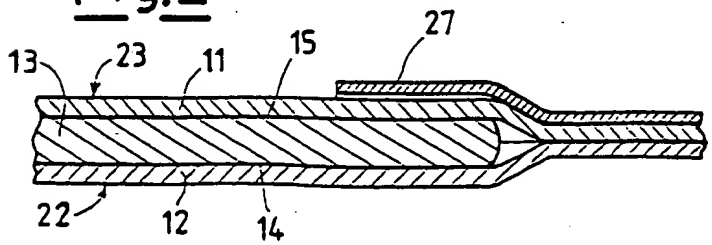
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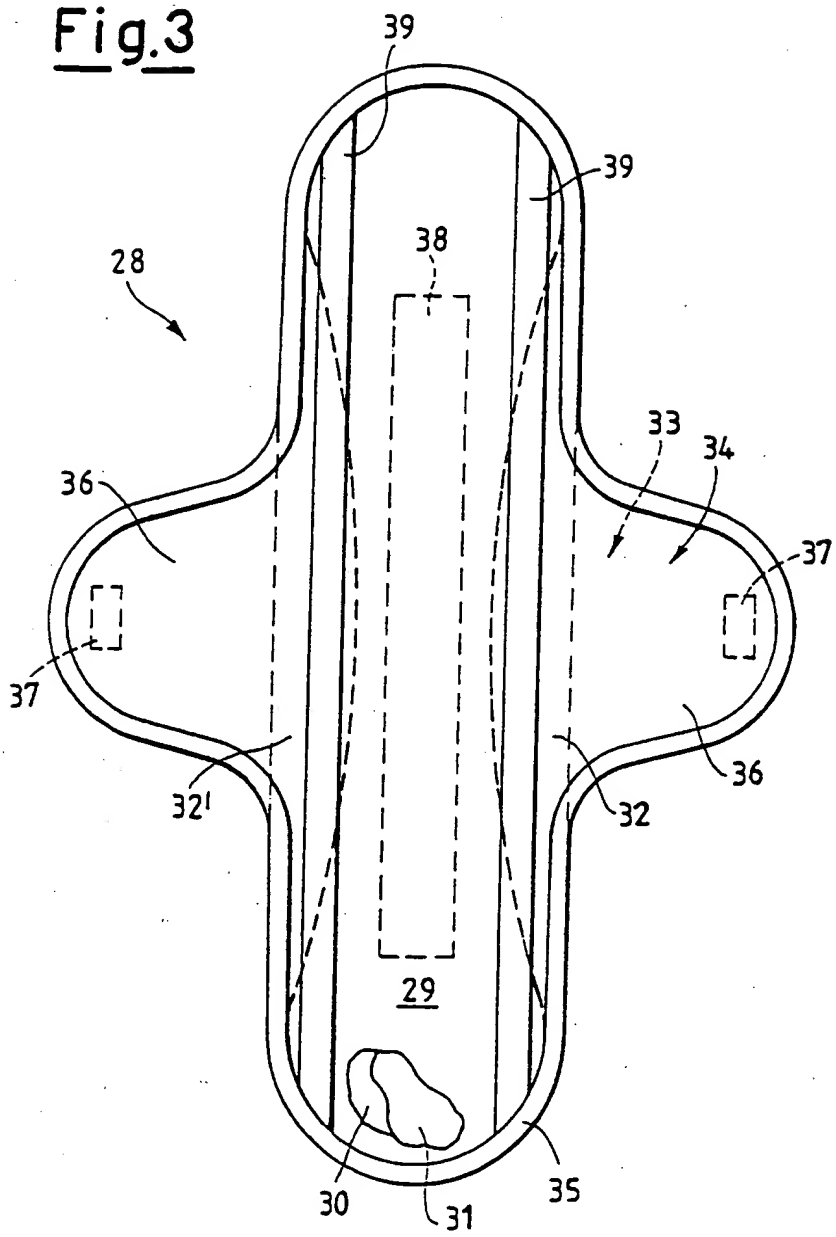
Fig.3



INTERNATIONAL SEARCH REPORT

Inte .onal Application No
PCT/EP 99/07383

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61F13/15

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 91 14414 A (JAMES RIVER CORP) 3 October 1991 (1991-10-03) page 1, line 2 - line 21; claims 1,3,4,24,25,30	1,2,6,7, 11,17, 18,22, 24,29,30
A	page 6, line 33 -page 7, line 23 page 8, line 10 - line 30 page 9, line 9 - line 29 page 15; table 1	3,25,27

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 January 2000	04/02/2000

Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL SEARCH REPORT

Int. ional Application No
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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A	EP 0 235 309 A (UNI CHARM CORP) 9 September 1987 (1987-09-09) page 2, line 34 - line 46 page 3, line 11 -page 4, line 57 page 4, line 17 - line 34; figures 1-4	1,7, 21-24,30

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